BULL. BOT. SURV. INDIA
Vol. 10, No. 1: pp. 17-19, 1968

PHARMACOGNOSTIC STUDIES ON THE STEM BARK OF *PSIDIUM GUAJAVA* LINN.

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ABSTRACT

The macroscopic and microscopic characters of the stem bark of *Psidium guajava* Linn. are described. Due to earlier defoliation of the previous cork layers the whole bark seems to consist of secondary phloem topped by cork cells. Absence of cortical tissue is one of the chief diagnostic characters. The bark is characterised by the presence of prismatic crystals of calcium oxalate in smaller phloem parenchyma cells, fusiform medullary ray cells terminated by tapering apical cells and absence of cortical and phloem fibres.

Psidium guajava Linn. (Hindi: *Amrut*; Bengali: *Piyara*; English: *Guava tree*; Tamil: *Koyya*; Telegu: *Ettajama*) is a large evergreen or semi-deciduous shrub belonging to the family Myrtaceae whose different parts such as stem bark, leaves and fruits are used in the indigenous system of medicine. The bark contains 27.4% tannin, resin and crystals of calcium oxalate. The stem bark is astringent, febrifuge and antiseptic. Very recently Seshadri and Vasishta (1963) have isolated a di-glucoside of ellagic acid from the stem bark; but further studies by Nair & Subramaniam (1964), reveal that the crude drug from 3 year old plant contained only ellagic acid and no glucosides as reported by Seshadri and Vasishta (1963). Thus it appears that the variation in the chemical components of the stem bark of the plant has to be borne in mind when the crude drug is collected for its medicinal use in the indigenous system of medicine, and the age of the plant is significant in this regard. As no detailed pharmacognostic studies of the stem bark are available, these studies have been taken up in order to identify the bark so that genuine samples may be available for commercial exploitation.

Distribution: The plant is native in tropical America. It is cultivated and naturalized throughout India and in most tropical countries (Hooker, 1879; Prain, 1963; Kirtikar & Basu, 1935).

Plant: A large shrub or small tree. Leaves 10-15 cm long, opposite, entire, ovate-oblong, glabrous above and pubescent beneath. Flowers 2.5-3.8 cm diameter, white, peduncles axillary, 1-3 flowered; sepals 4 or 5, calyx tube adnate to the ovary and produced above it, the upper free portion entire, closed in bud, at length bursting irregularly into lobes. Petals 4 or 5, free; stamens many inserted in several series on a wide disc; anthers oblong; carpels 2-7, usually 4 or 5, connate in an ovary with as many channels. Fruit a globose or pyriform berry 5 cm long or more (Prain 1963; Biswas & Ghosh, 1951; Hooker, 1879; Kirtikar & Basu, 1935).

Macroscopic characters: The stem bark is about 2-4 mm thick, smooth. Outer surface pale pinkish or buff with grey patches, exfoliating in very thin woody plates. The inner surface brown or buff coloured with pinkish tinge, either with fine striations or with small granular masses. The cork is thin and in some places is fused with secondary phloem. On drying the bark becomes quilled. Texture soft and brittle.

Microscopic characters: The phellem or cork is found all over the surface of the bark. Transection of the bark shows no cortical tissue. Cork consists of a few layered, thin-walled, tangentially elongated cells. The cells are rectangular in shape and in several places they are compressed. They are usually deep chocolate in colour and measure $T=15\mu-23\mu-30\mu$; $R=8\mu-15\mu-19\mu$ and $L=8\mu-15\mu-27\mu$. Due to earlier defoliation of the previous cork layers the whole bark seems to consist of secondary phloem topped by cork cells (Plate I, figs. 1 & 3). Phloem consists of phloem parenchyma, sieve tubes, companion cells and medullary ray cells. Phloem parenchyma cells are usually of two types, larger thin-walled and smaller cells. The larger cells are tangentially or radially elongated. These cells contain tannin but do not contain lignin, starch grains or crystals of calcium oxalate as confirmed by microchemical tests. The smaller phloem parenchyma cells which are intermingled with the former type are mostly filled with prismatic crystals of calcium oxalate, while

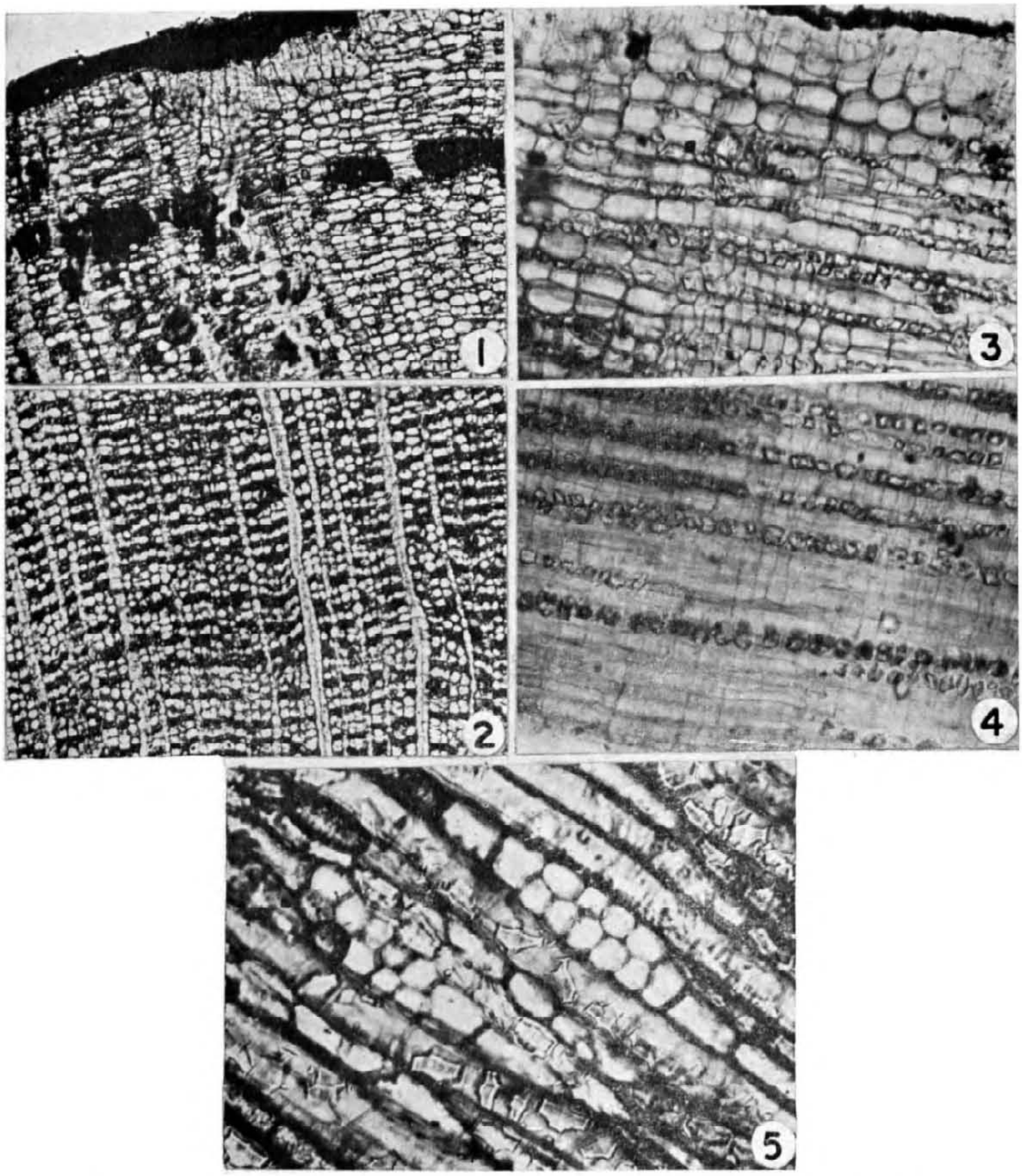
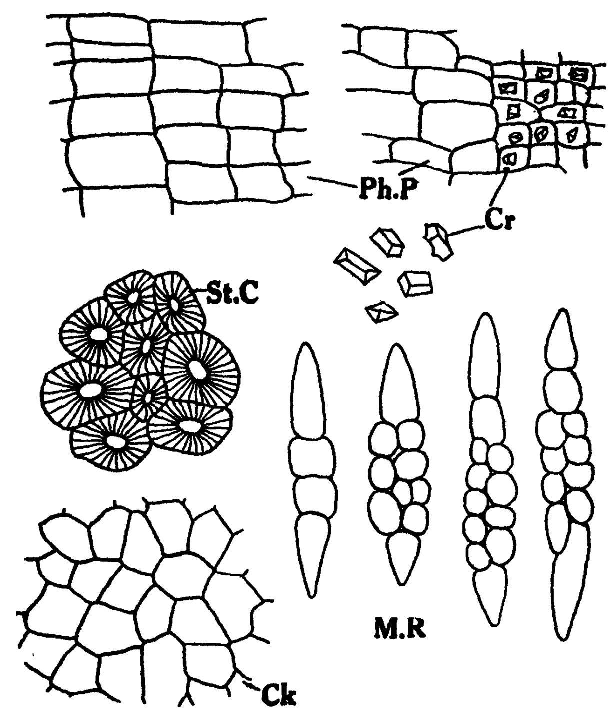


Plate I : Figs. 1-5 : 1. Transverse section of stem bark of *Psidium guajava* Linn. (Outer region) ×200. 2. Transverse section of stem bark of *Psidium guajava* Linn. (Inner region) ×150. 3. Radial longitudinal section (Outer region) ×450. 4. Radial longitudinal section (Inner region) ×300. 5. Tangential longitudinal section ×450.

a few of them are filled with cell-contents (Plate I, figs. 3 & 4). The larger cells measure $T=11\mu-19\mu-34\mu$; $R=11\mu-23\mu-34\mu$ and $L=15\mu-23\mu-34\mu$. The smaller phloem parenchyma cells which contain crystals measure $T=11\mu-19\mu-30\mu$; $R=11\mu-16\mu-23\mu$ and $L=8\mu-11\mu-15\mu$. Stone cells are found in small groups in tangential bands on the upper part of the bark, a few layers below the cork cells. Bands of stone cells are also found in the middle of the bark (Plate I, fig. 1). The stone cells measure $T=15\mu-19\mu-27\mu$; $R=19\mu-30\mu-38\mu$ and $L=23\mu-34\mu-45\mu$

Medullary ray cells are heterogenous in nature as viewed from radial-longitudinal and tangential longitudinal sections. In T.S. the medullary ray cells are usually two-celled in width throughout the bark section, thin-walled and are arranged in parallel radial rows. The cells in the upper region nearing the cork gradually broadens up and are tangentially elongated. They are more or less rectangular or polygonal in shape but those in the middle or in inner region of the bark are elongated radially. The cells towards the upper region nearing the cork cells measure $T=23\mu-38\mu-53\mu$; $R=11\mu-23\mu-38\mu$ and $L=15\mu-23\mu-34\mu$ while those in the lower region which are radially elongated measure $T=11\mu-15\mu-23\mu$; $R=23\mu-34\mu-49\mu$ and $L=19\mu-34\mu-46\mu$ In tangential longitudinal section the phloem ray cells look like fusiform structures. The middle portion is usually two-seriate or rarely one-seriate which are terminated by one or more elongated tapering apical cells on either side. (Plate I, fig. 5 and Text fig. 1, M.R.). The bark is characterised by the absence of cortical or phloem fibres.



Text fig. 1 : Camera lucida drawings of the different diagnostic elements as found in the powdered bark ×380.

CK=Cork cells; Cr.=Crystals; M. R.=Medullary ray cells; Ph. P=Phloem parenchyma cells; St. C=Stone cells.

Microchemical test of bark sections: Sections from fresh bark were treated with standard reagents for studying the elements present in the bark sections. Tannin was located almost throughout the bark. Presence of lignin in the stone cells and on the walls of the larger phloem parenchymatous cells was noticed. Saponin was also present. Starch grains are present in the medullary ray cells which are absent in phloem parenchyma cells. Cellulose was not detected in the bark section.

Powder: Reddish brown to brick-red in colour, taste astringent, odour slightly pungent. The powder when examined under the microscope is characterised by the presence of small groups of cork cells, stone cells, phloem parenchyma cells with or without prismatic crystals of calcium oxalate. Large number of isolated prismatic crystals of calcium oxalate and medullary ray cells are also found (Text fig. 1).

ACKNOWLEDGEMENTS

The author wishes to express his indebtedness to Rev. Father Dr. H. Santapau, for his valuable suggestions during the course of investigation. Thanks are also due to Shri K. S. Srinivasan, Deputy Director, Botanical Survey of India for his kind interest.

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